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U1S S2206

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US 5881989 A US 5689574 A

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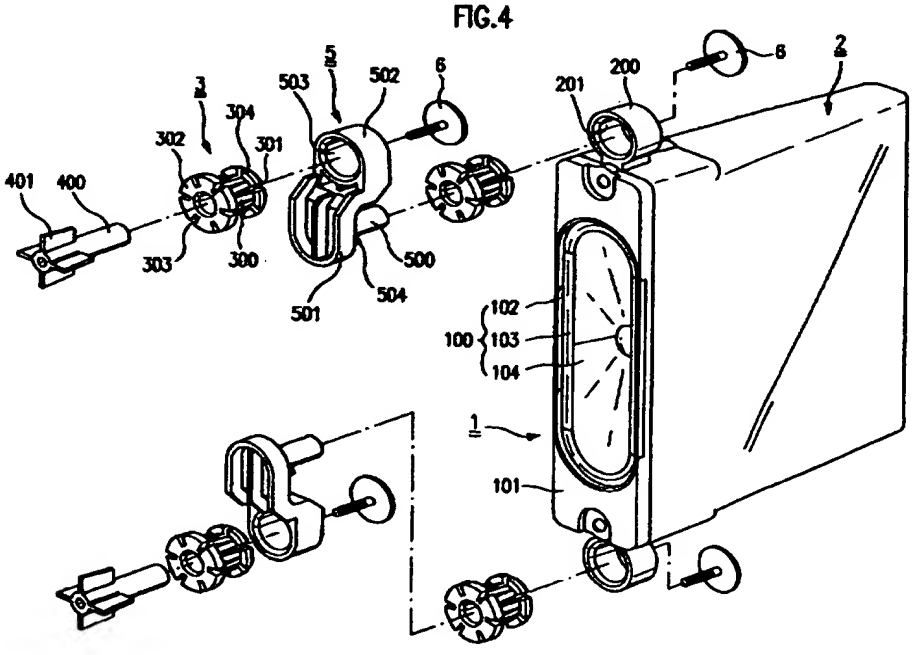
(54) Abstract Title
**Multiple damping device for a speaker system in video display equipment**

(57) A multiple damping device for a speaker system for video display equipment includes multiple damping structures in the speaker system that results in a low howling and a high sound quality. The multiple damping device of the speaker system includes a cover frame united-type speaker 100; a back cover 2 assembled at the back portion of the cover frame united-type speaker adapted to receive a damping member fitting portion at the top and bottom portions thereof, respectively; and a multiple damping part 3 adapted to be installed between the cover frame united-type speaker and a cabinet to reduce the transmission of the vibration to the cabinet generated upon the operation of the speaker system.

FIG.4

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG.1
Related Art

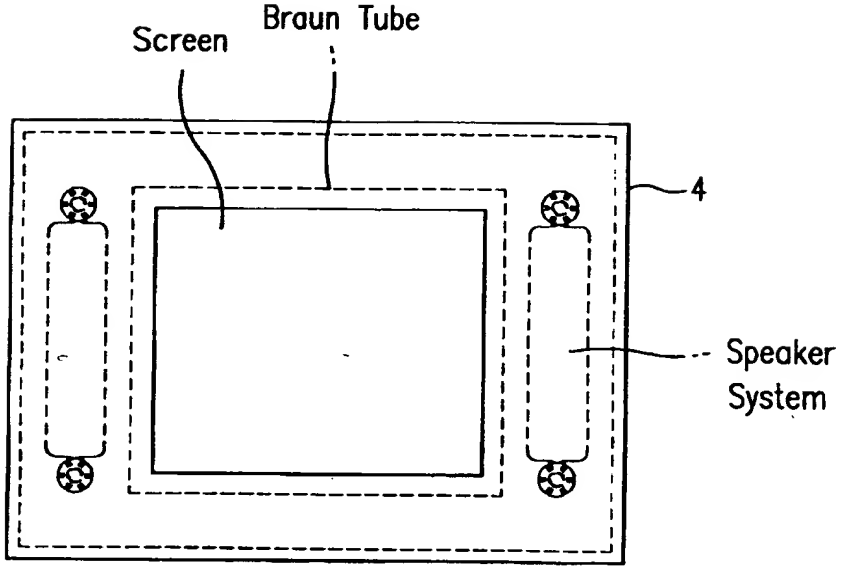


FIG.2
Related Art

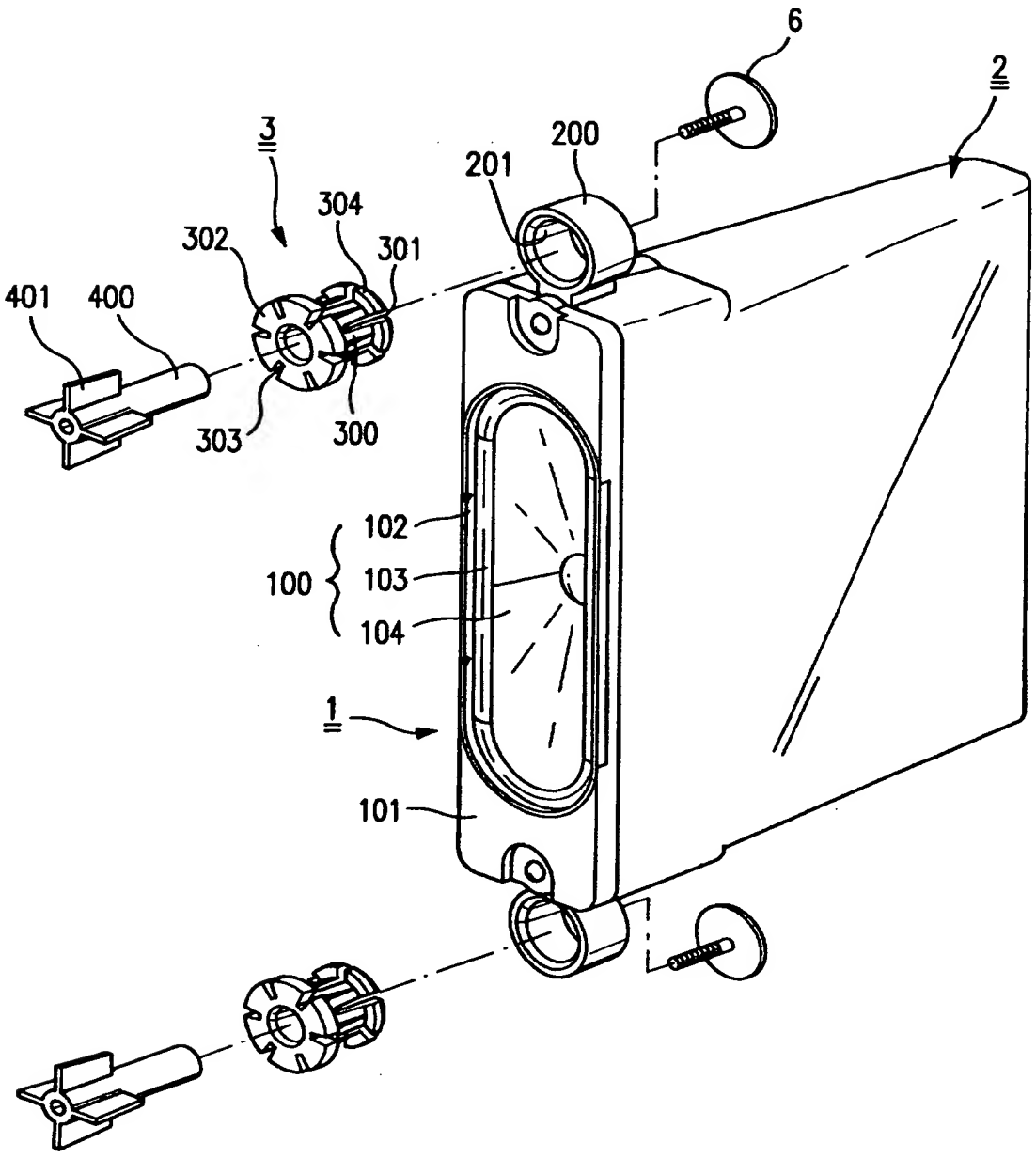


FIG.3
Related Art

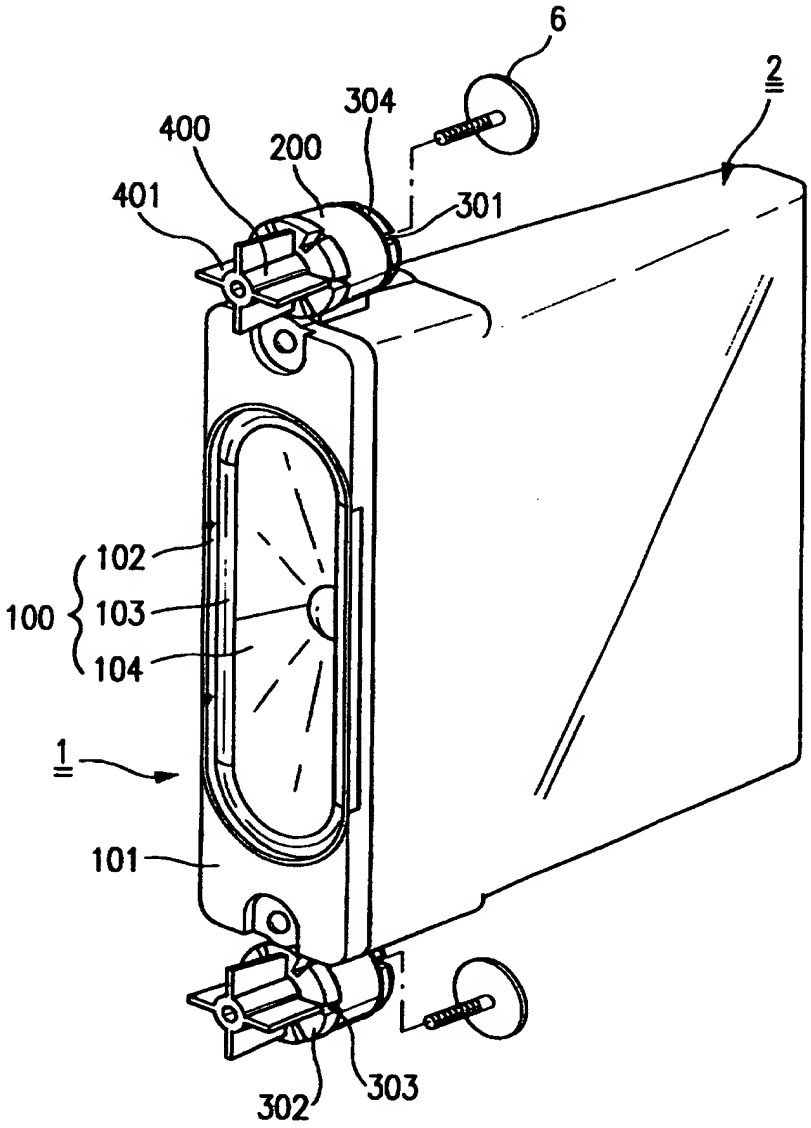
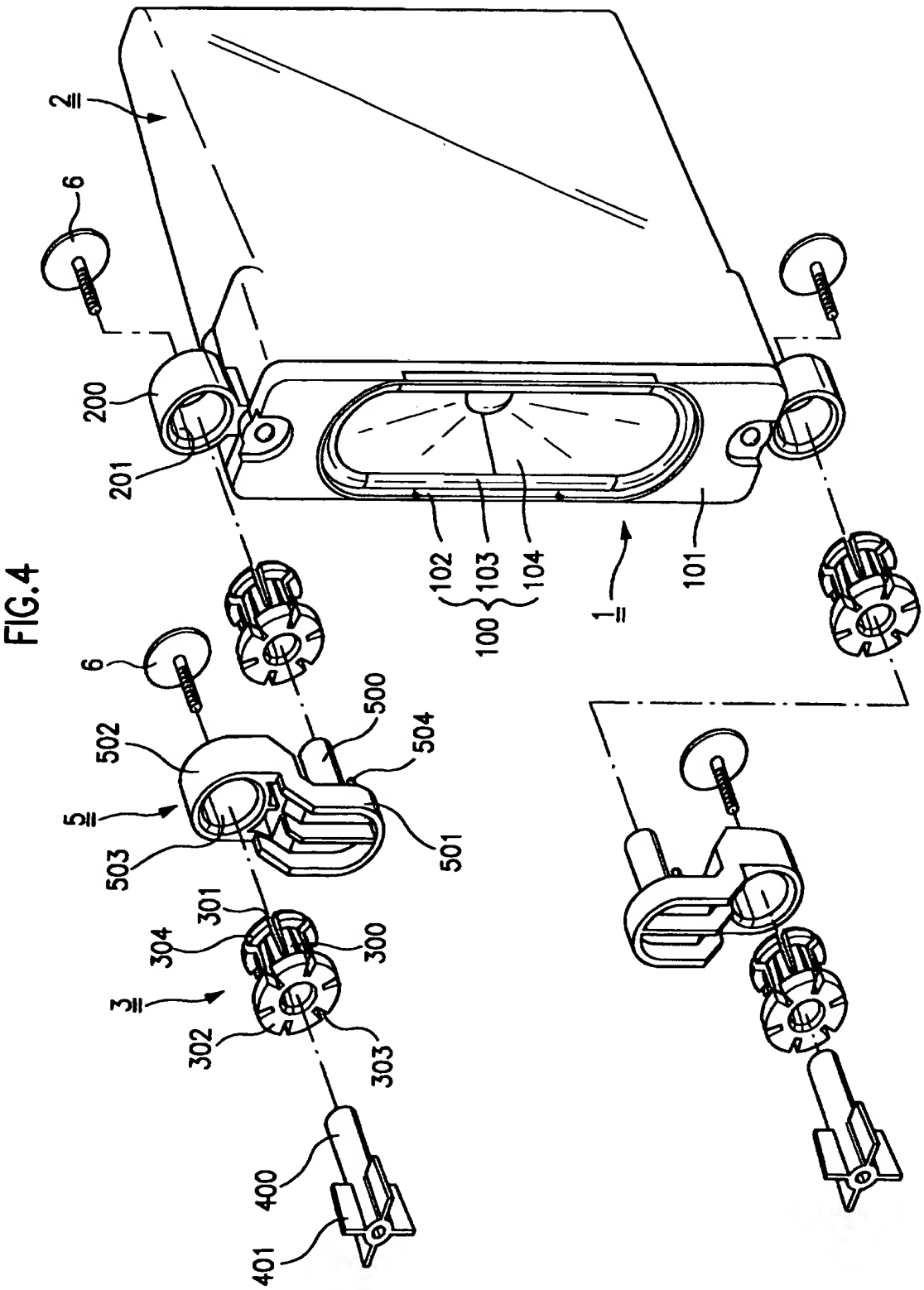


FIG.4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201
102
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401

FIG.5

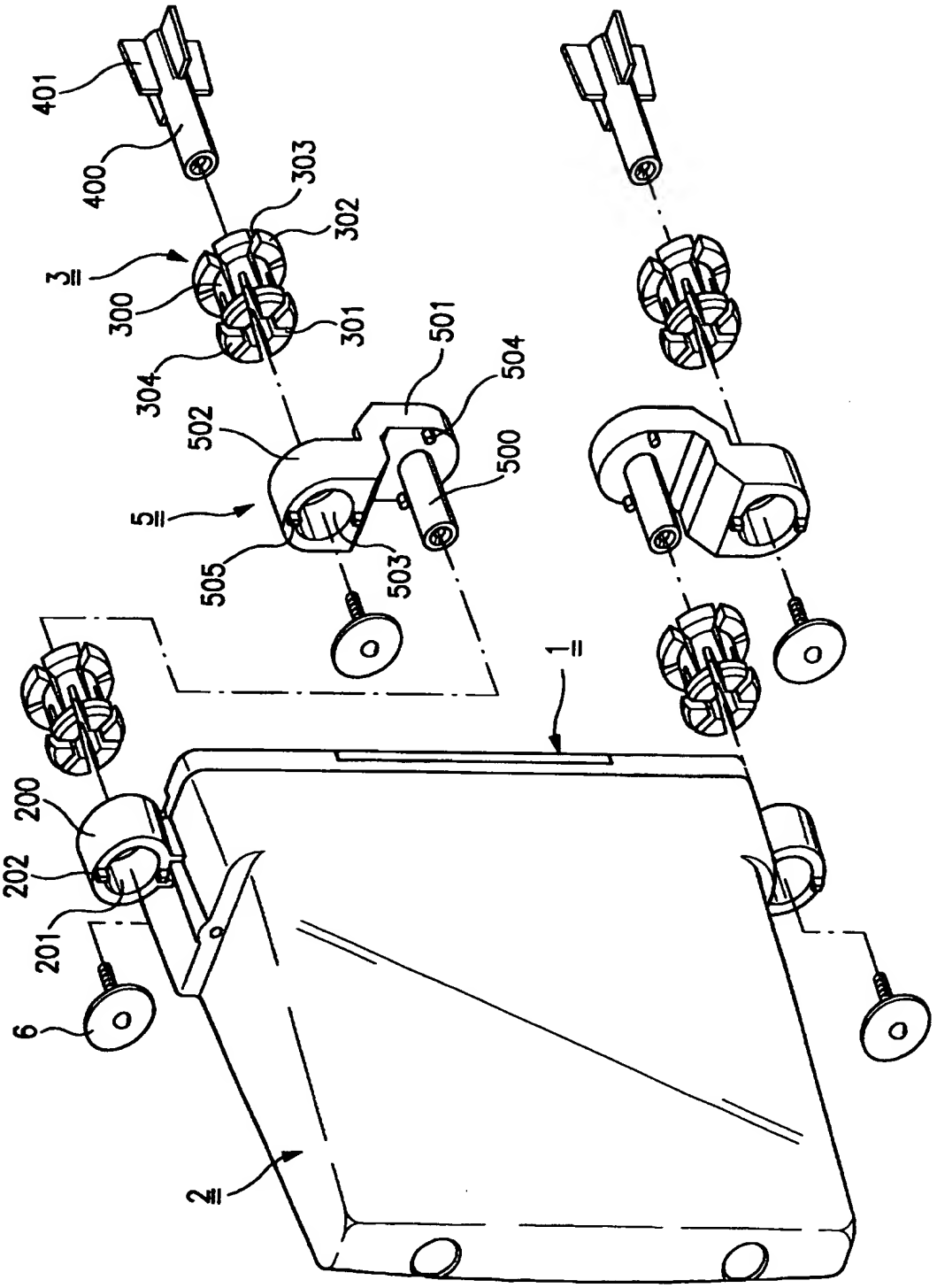
401
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FIG.6

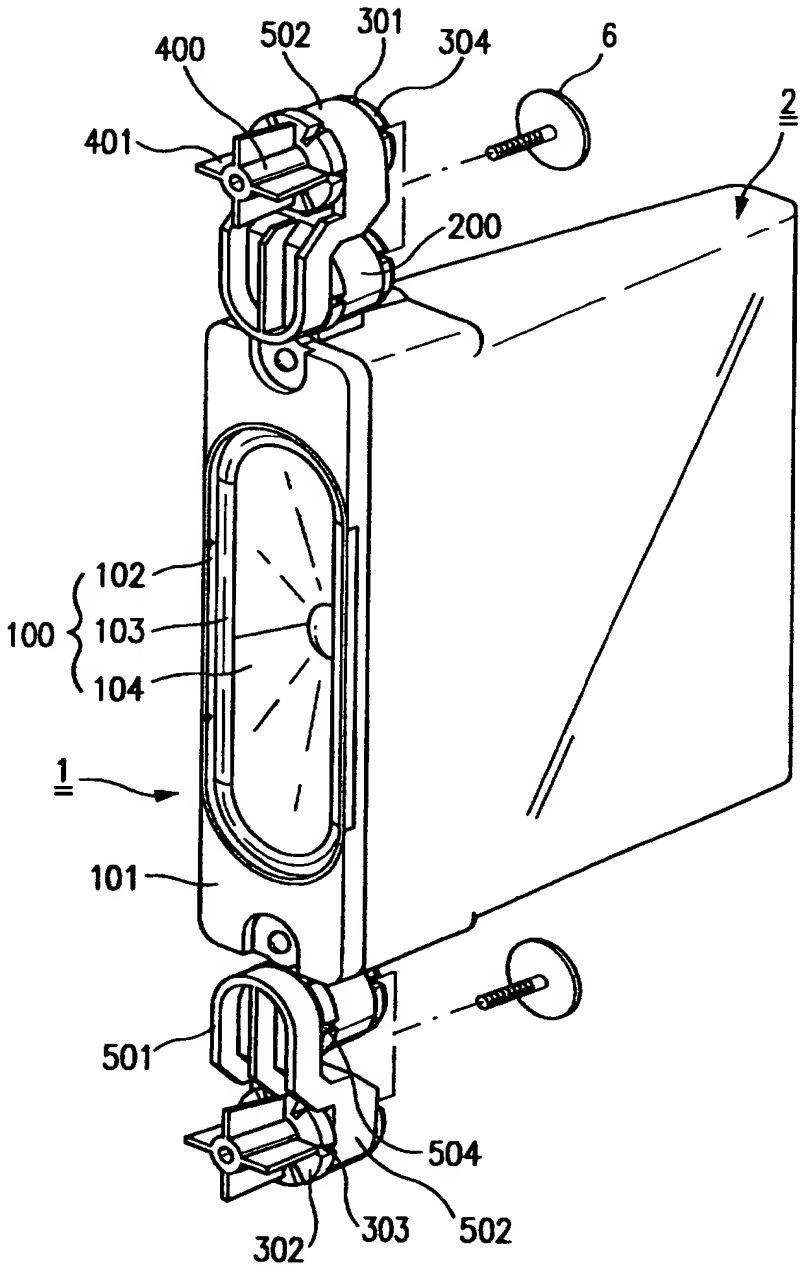
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FIG.7A

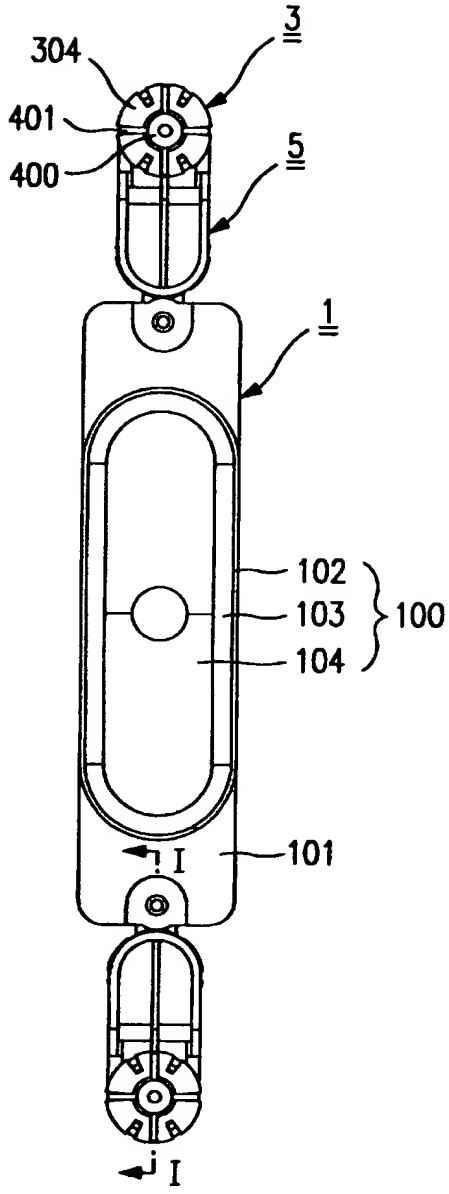


FIG.7B

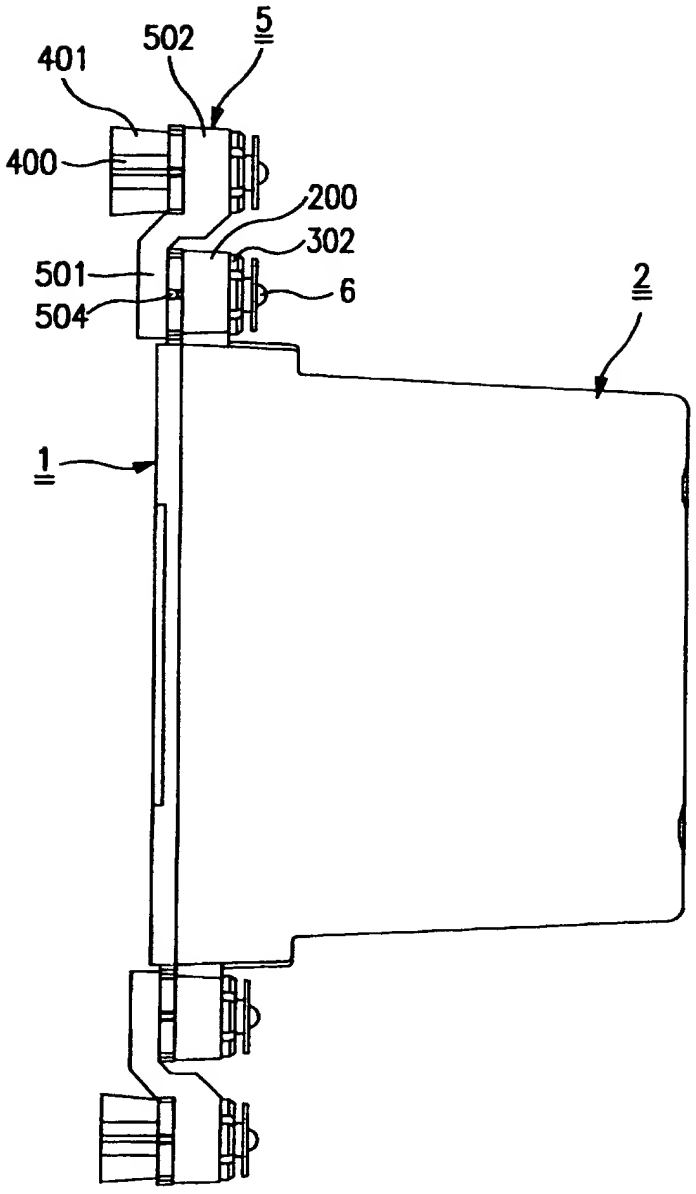


FIG.8

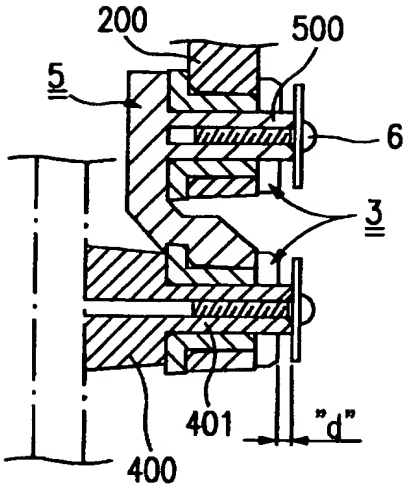
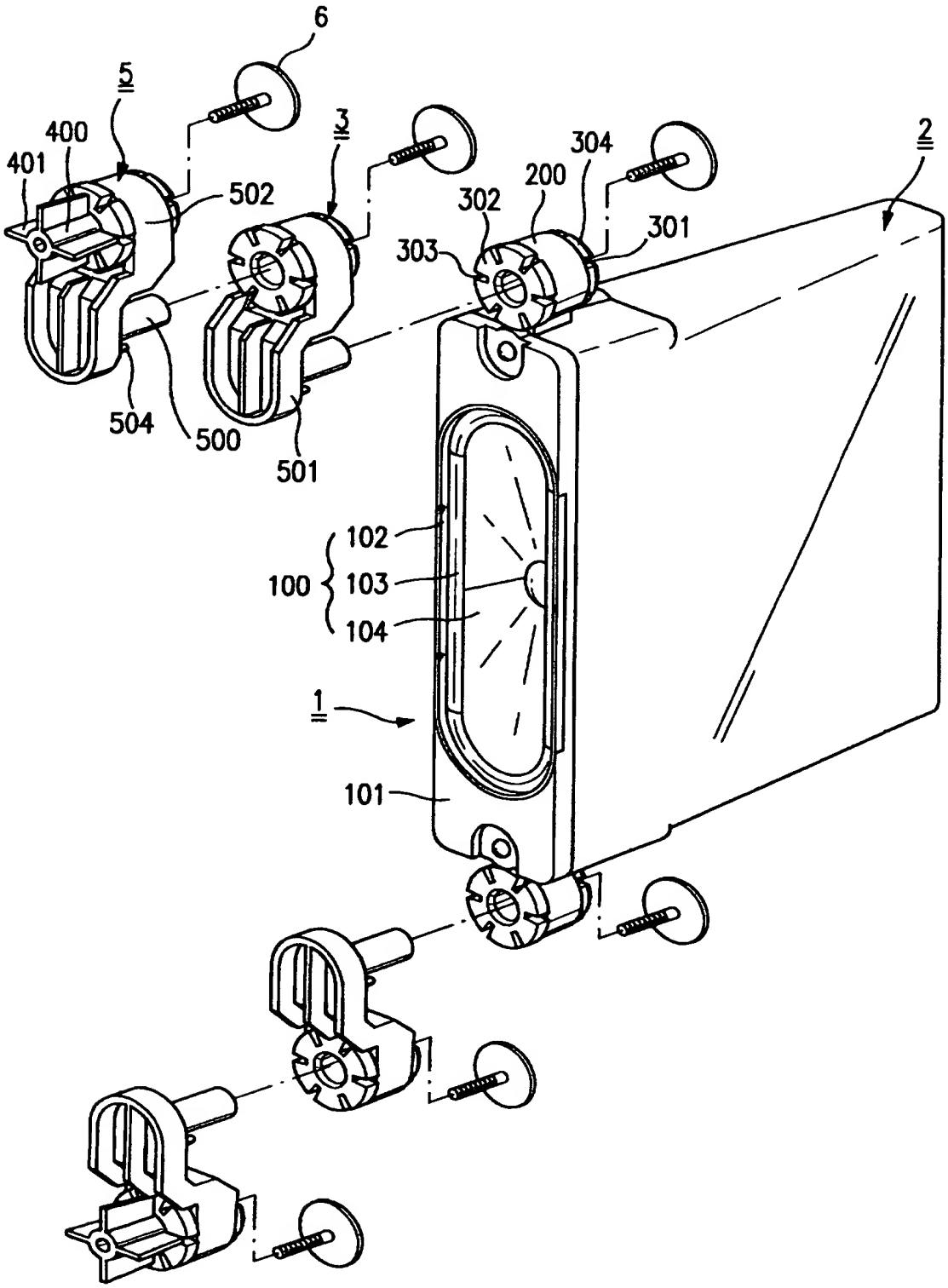


FIG.9


6
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1
101

FIG.10

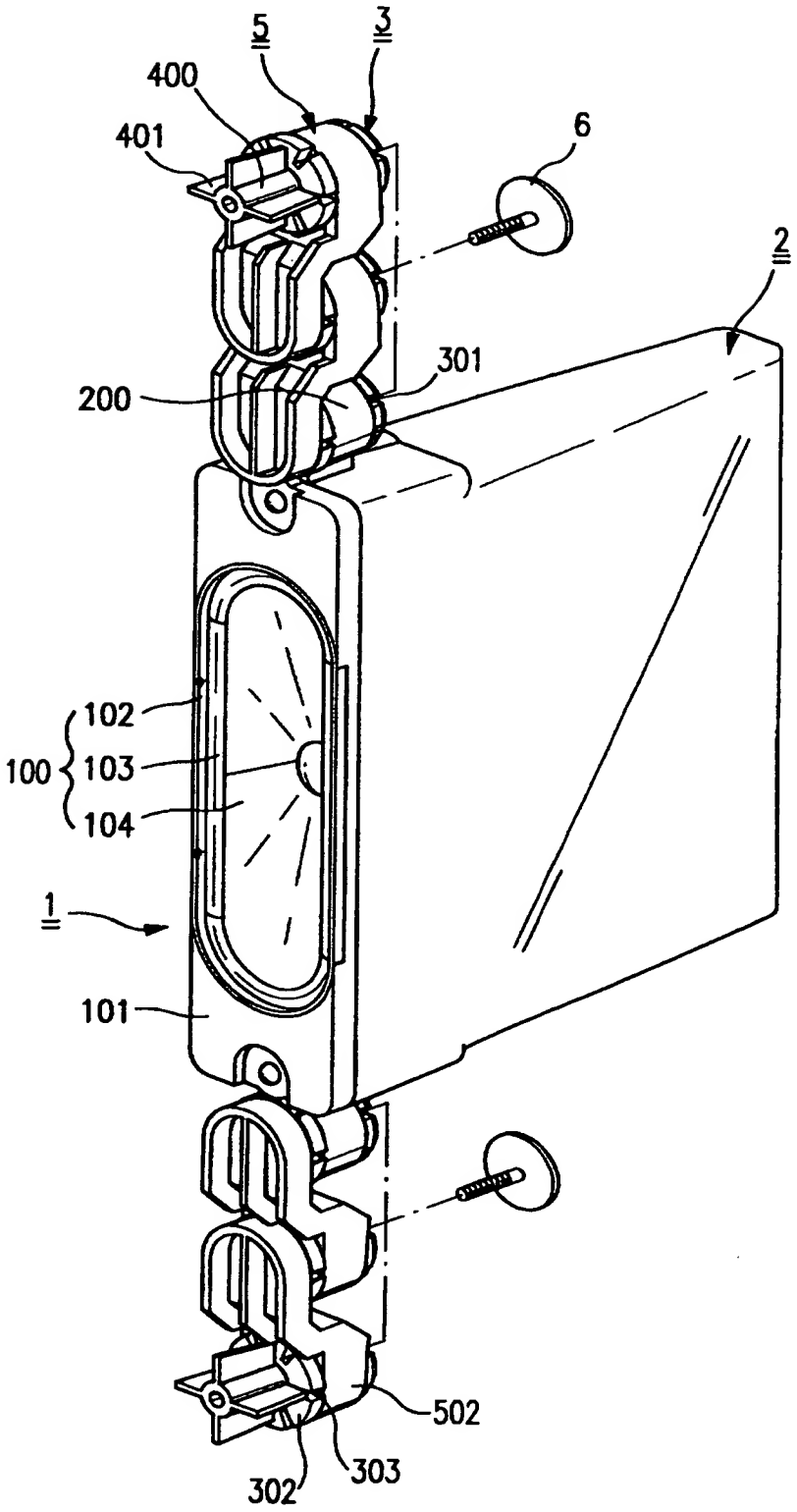
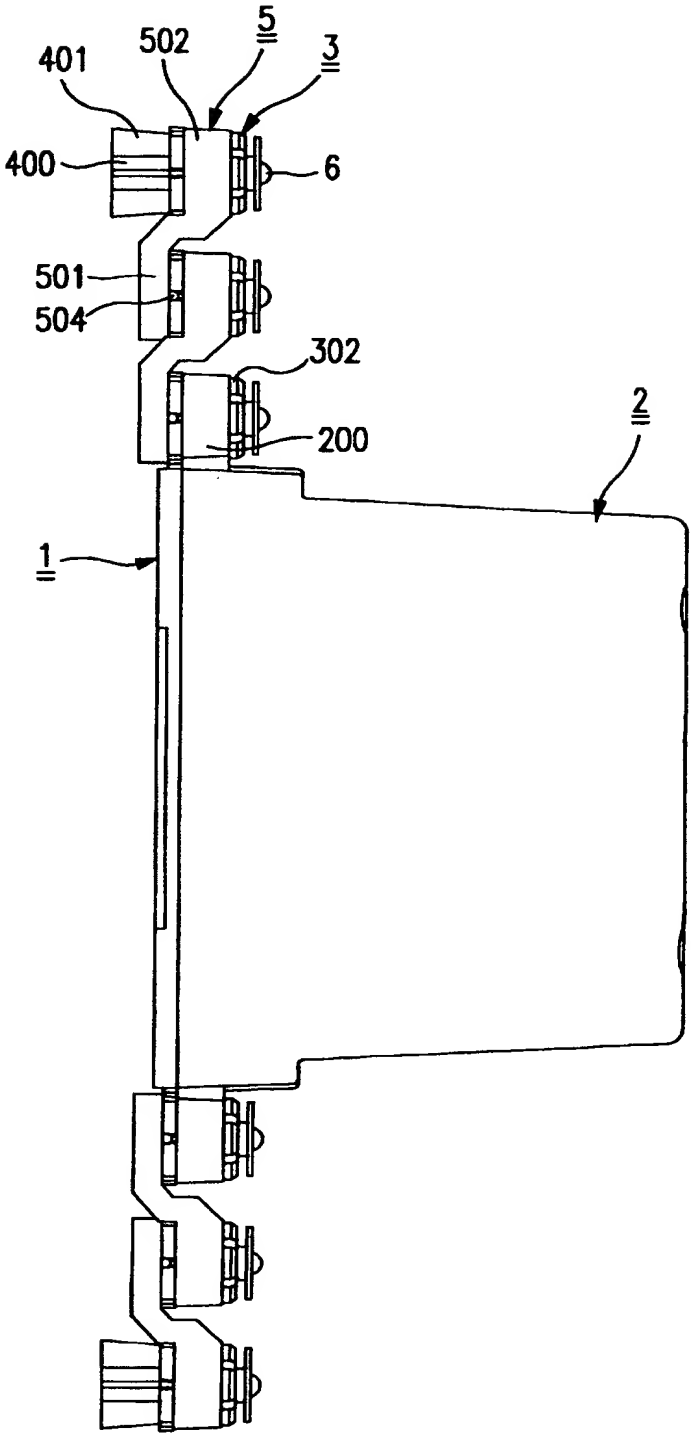


FIG.11



# MULTIPLE DAMPING DEVICE FOR A SPEAKER SYSTEM FOR VIDEO DISPLAY EQUIPMENT

The present invention relates to a speaker system for video display equipment, and more particularly, to a multiple damping device for a speaker system for video display equipment.

Generally, video display equipment such as computer monitor, which includes a speaker system, is arranged so that the speaker system is in the space between the outside wall of a Braun tube and the inside wall of a cabinet adapted for surrounding the Braun tube, as shown in FIG. 1. The dimensions of the speaker system depend, therefore, upon the width of the installation space.

In addition, the dimensions of the speaker system define the width or "short-diameter" of the speaker as well as the ratio of the short-diameter to the length, or "long-diameter" thereof.

The ration of the short-diameter to the long-diameter of the speaker affects the quality of sound from the speaker. Generally, higher quality of sound is obtainable from the speaker system when the ratio of the short-diameter to the long-diameter is 1:1.

In other words, high sound quality is obtainable from the speaker system when a gasket and cone paper that constitute the speaker are of a geometrically regular and round shape.

The construction of a prior art speaker system for video display equipment will be described with reference to

FIGS. 1 to 3.

FIG. 1 is a schematic illustration of a prior art speaker system of video display equipment;

FIG. 2 is an exploded perspective view illustrating the speaker system according to FIG. 1 and a damping device thereof; and

FIG. 3 is a perspective view illustrating the components of FIG. 2 as assembled.

As shown in FIGS. 1 and 2, a prior art track-type speaker system for video display equipment includes a cover frame united-type speaker 1 having a cover frame 101 and a speaker 100 for generating sound; and a back cover 2 assembled at the back portion of the cover frame united-type (integral) speaker 1 adapted to receive a damping member fitting portion 200 at the top and bottom portions thereof. A damping member 3 is adapted to be inserted into a damping member fitting hole 201 in the damping member fitting portion to couple the cover frame united-type speaker 1 and the back cover 2 to a cabinet 4; and for damping the vibrations generated upon the operation of the speaker that are transmitted to the cabinet 4.

The speaker 100 comprises a gasket 102, a ring-shaped edge 103 attached to the inside of the gasket, and cone paper 104 attached to the inside of the edge 103.

Alternatively, the damping member 3 may comprise a hollow cylinder type body portion 300 having a plurality of cutting grooves 301 on the circumferential surface thereof, a flange portion 302 formed in a radial direction on one end where the plurality of cutting grooves 301 of the body portion 300 are not formed, and protrusions 304 formed in a radial direction on the other end where the

plurality of cutting grooves 301 of the body portion 300 are formed.

To assemble these components, the cover frame united-type speaker 1 is connected to the back cover 2. As shown in FIG. 2, the damping member 3 is then inserted into the damping member fitting hole 201 of the damping member fitting portion 200 that is formed on the top and bottom ends of the back cover 2, respectively.

After the body portion 300 of the damping member 3 is completely inserted into the damping member fitting hole 201, the damping member 3 is restored to its original shape by an elastic force. The protrusions 304, which are formed on the other end of the body portion 300 at which the cutting grooves 301 are formed, are then positioned on the back edge of the damping member fitting portion 200 which prevents the deviation of the damping member 3.

The body portion 300 of the damping member 3 mounted on the speaker 100 is then passed through a speaker system fitting boss 400 formed on the cabinet 4, and the speaker system fitting boss 400 is then fastened with a screw and washer 6.

The flange portion 302 of the damping member 3 serves to prevent direct contact of a positioning rib 401 with the damping member fitting portion 200.

One aim of this prior art construction is to eliminate the vibrations generated by the operation of the speaker system and the phenomenon of screen filtering of the video display equipment by means of the particular material characteristics and geometrical structure of the

damping member 3.

However, such prior art speaker systems for video display equipment implement the vibration damping operation only once, so the prior art suffers from the problem that it fails to fully damp the vibrations transmitted to the cabinet 4.

If significant amounts of vibration are not damped by means of the damping member 3 and are transmitted to the cabinet 4, the vibration can be transmitted to the Braun tube which gives rise to resonance of a shadow mask installed on the inside of the Braun tube, which generate flickering on the screen.

When such screen flickering occurs due to insufficient damping, the speaker system can not raise the sound intensity over a corresponding predetermined wattage output value to increase the low pass frequency bandwidth.

Such prior art systems that cannot increase the wattage of the speaker because of such incomplete damping suffer from serious flickering on the screen at a frequency band under about 200 Hz. As a result the system, cannot increase the low pass frequency bandwidth. Such failure to adequately damp the system therefore degrades the quality of sound from the speaker system.

It is the object of the present invention, which is directed to a multiple damping device for a speaker system for video display equipment, at least to alleviate such problems with the prior art.

The present invention is defined in the accompanying

independent claims. Some optional features are recited in the dependent claims.

One aim is to provide a multiple damping device for a speaker system for video display equipment which is capable of passing the vibrations generated upon the operation of the speaker system through a multiple damping path to prevent the screen flickering in the video display equipment that is caused by the vibration transmitted to a cabinet, in which the speaker system can produce a high wattage output to enable extension of the low pass frequency bandwidth.

According to one embodiment, there is provided a multiple damping device for a speaker system for video display equipment having a cover frame united-type speaker means; a back cover assembled at the back portion of the cover frame speaker adapted to receive a damping member fitting portion at the top and bottom portions thereof, respectively; and a damping member adapted to be inserted into a damping member fitting hole to couple the cover frame united-type speaker and the back cover to a cabinet for damping the vibrations generated upon the operation of the speaker that are transmitted to the cabinet, the multiple-damping device including: a multiple damping part adapted to be installed between the cover frame united-type speaker and the cabinet for reducing the transmission of the vibrations generated upon the operation of the speaker system to the cabinet.

The present invention can be put into practice in various way some of which will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a schematic illustration of a prior art

speaker system for video display equipment;

FIG. 2 is an exploded perspective view illustrating the speaker system according to FIG. 1 and a damping device thereof;

FIG. 3 is a perspective view illustrating the assembled speaker system according to FIG. 2;

FIG. 4 is an exploded perspective view in a first direction of a speaker system for video display equipment having a double damping structure according to a first embodiment of the present invention;

FIG. 5 is an exploded perspective view in a second direction of the speaker system according to FIG. 4;

FIG. 6 is a perspective view illustrating the speaker system according to FIGS. 4 and 5 as assembled;

FIG. 7A is a top view of the speaker system according to FIG. 6;

FIG. 7B is a side view of the speaker system according to FIG. 6;

FIG. 8 is a longitudinal sectional view taken along the line I-I of the speaker system according to FIG. 7A;

FIG. 9 is an exploded perspective view of a speaker system for video display equipment having a triple damping structure according to a second embodiment of the present invention;

FIG. 10 is a perspective view illustrating the speaker system according to FIG. 9, as assembled; and

Fig. 11 is a side view of the speaker system according to FIG. 10.

According to a first embodiment of the present invention, there is provided a multiple damping device for a speaker system for video display equipment having a cover frame united-type speaker 1 having a cover frame 101 and a speaker 100; a back cover 2 assembled at the back portion

of the cover frame united-type speaker 1 adapted to receive a damping member fitting portion 200 at the top and bottom portions thereof. The damping member 3 is adapted to be inserted into a damping member fitting hole 201 to couple the cover frame united-type speaker 1 and the back cover 2 to a cabinet 4, and for damping the vibrations generated by operation of the speaker that are transmitted to the cabinet 4. The multiple damping device includes a multiple damping part adapted to be installed between the cover frame united-type speaker 1 and the cabinet 4 to reduce the transmission of vibrations to the cabinet 4 that are generated by operation of the speaker system.

To assemble the system, a first damping member 3 of the multiple damping part is inserted into the damping member fitting hole 201 of the damping member fitting portion 200 which is located on each of the top and bottom ends of the cabinet 4, a connector 5 inserted into the inner peripheral surface of the body portion 300 of the first damping member 3 to be multiply connected thereto and a second damping member 3 connected on the top end of the connector 5.

The first and second damping members 3 are formed by the same structure and materials as each other. The first and second damping members 3 are made of rubber or silicon material in one embodiment, and include the hollow cylinder type of body portion 300 which has a plurality of cutting grooves 301 on its circumferential surface, a flange portion 302 formed in a radial direction on the one end where the plurality of cutting grooves 301 of the body portion 300 are not formed, and protrusions 304 formed in a radial direction on the other end where the plurality of

cutting grooves 301 of the body portion 300 are formed.

The connector 5 includes a first body portion 501 adapted for coupling with the first damping member 3 and a second body portion 502 adapted for coupling with the second damping member 3.

The connector 5 comprises the first body portion 501, including a damping member combining boss 500 adapted for insertion into the inner peripheral surface of the body portion 300 of the first damping member 3 and the second body portion 502 is integrated with the first body portion 501 so that it is positioned on the top portion of the damping member combining boss 500 to form a damping member fitting hole 503 into which the second damping member 3 can be inserted.

Preferably, the first and second damping members 3 that are coupled with the damping member fitting portion 200 formed on the back cover 2 and the connector 5, respectively, are assembled so that they are on the same line in the vertical direction thereof.

A rotating protection (prevention) protrusion 202, which is adapted to prevent the rotation of the first damping member 3, is inserted into the damping member fitting hole 201, which is provided on the top and bottom portions of the back edge of the damping member fitting portion 200 which is formed on the back cover 2.

The rotating protection protrusion 202 is positioned on the cutting groove 301 formed between the protrusions 304, when the first damping member 3 is assembled on the damping member fitting portion 200.

Upon the insertion of the damping member combining boss 500 into the interior of the body portion 3000 of the first damping member 3, a rotating protection protrusion 504, which is provided on the left and right sides of the damping member combining boss 500 of the first body portion 501, is positioned on the cutting groove 303 formed on the flange portion 302 of the first damping member 3 to thereby protect the rotation of the connector 5.

Also, upon the insertion of the second damping member 3 into the damping member fitting hole 503 of the second body portion 502 of the connector 5, a turning (rotation) protection (prevention) portion 505, which is provided on the top and bottom portion 502 of the connector 5, respectively, is adapted to be positioned on the cutting groove 301 formed between the protrusions 304 of the second damping member 3 to prevent the rotation of the second damping member 3 inserted into the damping member fitting hole 503 of the second body portion 502.

The cabinet 4 is provided on the top portion thereof with a speaker system fitting boss 400 which is coupled with the second damping member 3 by means of a screw and washer 6 and a plurality of positioning ribs 401 for defining the insertion position of the second damping member 3 on the outer peripheral surface of the speaker system fitting boss 400.

The distance between the positioning ribs 401 to the head of the screw and washer 6, which is fastened on the speaker system fitting boss 400, is adapted to be longer by a predetermined distance (the distance "d" as shown in

FIG. 8) than the axial length of the second damping member 3. In addition, the diameter of the speaker system fitting boss 400 is adapted to be substantially smaller than the inside diameter of the body portion 300 of the second damping member 3.

The compression of the screw and washer 6 against the second damping member 3 is therefore prevented and the movement of the speaker system coupled with the second damping member 3 is along the axial direction of the speaker system fitting boss 400.

To assemble the components described above according to the first embodiment, the cover frame united-type speaker 1 is attached to the back cover 2, the first damping member 3 is inserted into the damping member fitting hole 201 of the damping member fitting portion 200 which is formed on the top and bottom ends of the back cover 2, respectively. The first damping member 3 is then inserted into the damping member fitting hole 201; the body portion 300, having the cutting grooves 301, being reduced towards the radial center thereof.

After the body portion 300 of the first damping member 3 is completely inserted into the damping member fitting hole 201, the damping member 3 is restored to its original shape by an elastic force. The protrusions 304, which are formed on the other end of the body portion 300 on which the cutting grooves 301 are formed, are thereby positioned on the back edge of the damping member fitting portion 200 to prevent the deviation of the first damping member 3.

The protrusions 304 are locked on the back edge of the damping member fitting portion 200 to prevent the

deviation of the first damping member 3 towards the axial direction of the damping member fitting portion 200.

When the first damping member 3 is inserted into the damping member fitting portion 200, the rotating protection protrusion 202, (which is formed on the top and bottom portions of the back edge of the damping member fitting portion 200 formed on the back cover 2, respectively), is positioned on the cutting groove 301 formed between the protrusions 304 to protect the rotation of the first damping member 3 inserted into the damping member fitting hole 201.

After the first damping member 3 has been assembled on the damping member fitting portion 200 of the back cover 2, the connector 5 is coupled with the first damping member 3.

The damping member combining boss 500 of the connector 5 is inserted into the inner peripheral surface of the body portion 300 of the first damping member 3.

The rotating protection protrusion 504, which is provided on the left and rights sides of the damping member combining boss 500 of the first body portion 501, respectively, is positioned on the cutting groove 303 formed on the flange portion 302 of the first damping member 3 to protect (prevent) the rotation of the connector 5.

After the first damping member 3 has been coupled with the connector 5, the second damping member 3 is inserted into the damping member fitting hole 503 of the second body portion 502 of the connector 5.

The inserting method of the second damping member 3 is the same as for the first damping member 3.

After the first and second damping members 3 are coupled through the connector 5 on the speaker system, the body portion 300 of the second damping member 3 is inserted into the speaker system fitting boss 400 on the cabinet 4. The coupling of the second damping member 3 with the speaker system fitting boss 400 is completed by means of the screw and washer 6.

In more detail, after the body portion 300 of the second damping member 3 has been inserted into the speaker system fitting boss 400 on the cabinet 4, the speaker system is coupled with the speaker system fitting boss 400 by means of the screw and washer 6, as shown in FIG. 6.

Compared with prior art speaker systems, the speaker system of the present invention, after assembly, facilitates higher quality sound production.

Moreover, the present speaker system can implement the vibration damping operation several times, and therefore can minimize the amount of the vibration transmitted to the cabinet.

Owing to the formation of the plurality of cutting grooves 301 and 303 on the body portion 300, the flange portion 302 and the protrusions 304 of the first damping member 3, each contact area of the front and back edges of the damping member fitting portion 200 with the flange portion 302, and the protrusions 304 of the first damping member 3 are reduced. The contact area of the body portion 300 of

the first damping member 3 with the inner peripheral surface of the damping member 3 with the inner peripheral surface of the damping member fitting hole 201 of the damping member fitting portion 200 is therefore reduced.

Owing to the formation of the plurality of cutting grooves 301 and 303 on the body portion 300, the flange portion 302 and the protrusions 304 of the second damping member 3, the contact area of the body portion 300 with the speaker system fitting boss 400 on the cabinet 4 is reduced. The contact area of the flange portion 302 of the second damping member 3 with the positioning ribs 401 on the outer peripheral surface of the speaker system fitting boss 400 is thereby reduced, and so the contact area of the second damping member 3 with the inner peripheral surface of the damping member fitting hole 503 of the connector 5 is also reduced.

Of course, the reduction of the vibration transmission area means that the amount of vibration which is transmitted to the cabinet 4 during the operation of speaker is decreased.

The multiple damping device of the speaker system for video display equipment according to the present invention is capable of decreasing the transmission of vibrations several times by means of the damping members 3 having elastic properties (by an elastic force) and the geometrical shape for reducing the vibration transmission area, thereby eliminating screen flickering of the video display equipment.

The speaker system of the present invention is provided with a multiple damping part through which the vibrations

generated from the speaker are effectively damped to prevent screen flickering caused by the vibration of the speaker system, whereby the wattage of the speaker can be raised to lower the reproduction low pass frequency band of the sound waves, thus obtaining higher sound quality.

A multiple damping device for a speaker system for video display equipment according to a second embodiment of the present invention will be described with reference to FIGS. 9 to 11.

According to the second embodiment, the speaker system improves the damping performance by cutting the vibration by means of a number of multiple damping paths, whereby a high quality of sound can be obtained.

If the connector and the damping member as disclosed in the first embodiment of the present invention are coupled to each other in a multistage manner, the multiple damping device has a fourfold or fivefold vibration reducing path. The speaker system can gave the fourfold or fivefold damping structure, depending upon the height of the system.

The multiple damping device for a speaker system for video display equipment according to the preferred embodiments of the present invention can implement the vibration damping operation on the vibration transmission path several times, thereby minimizing the amount of the vibration transmitted to the cabinet so that the speaker system has low howling and high quality sound production.

The speaker system for video display equipment according to the present invention can include a multiple damping

part through which the vibration generated from the speaker is effectively damped to prevent screen flickering caused by the vibration of the speaker system. The wattage of the speaker can be raised, so that the low pass reproduction frequency band of the sound wave can be lowered (bass response extended) to obtain better sound quality.

It will be apparent to those skilled in the art that various modifications can be made in a multiple damping device for a speaker system for video display equipment according to the present invention without departing from the scope of the invention. It is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims.

Claims:

1. A multiple damping device for a speaker system for video display equipment; comprising an integral speaker and cover arrangement; a back cover arranged behind the speaker and cover arrangement which is adapted to receive a damping member fitting portion at spaced locations thereon; a cabinet; and multiple damping means, including a damping member adapted to be inserted into a damping member fitting hole and coupling the speaker and cover arrangement and the back cover to the cabinet, the multiple damping means being adapted to be installed between the speaker means an the cabinet, wherein the transmission to the cabinet of vibrations generated upon operation of the speaker is reduced.

2. The device as claimed in claim 1, wherein said multiple damping means comprises a first damping member adapted to be inserted into a damping member fitting hole in the speaker mounting means; a connector adapted to be inserted into the first damping member on one side; and a second damping member connected on the other side of the connector.

3. The device as claimed in claim 2, wherein each of said first and second damping members comprise a hollow cylindrical body having a plurality of grooves on the circumferential surface thereof; a radial flange portion formed on one end of the body separate from the grooves; and radial protrusions formed on the other end of the body adjacent the plurality of grooves.

4. The device as claimed in claim 2, wherein said first and second damping members are made of an elastomeric

material, for example, rubber or silicon.

5. The device as claimed in claim 2, wherein said connector comprises:

a first body portion, including a damping member combining boss inserted into the body portion; and

a second body portion integral with said first body portion and disposed on the boss and defining a damping member fitting hole into which the second damping member is inserted.

6. The device as claimed in claim 2, wherein said first and second damping members are arranged vertically on opposite sides of the speaker.

7. The device as claimed in claim 2, wherein the damping member fitting portion has a first protrusion for preventing rotation of the first damping member by engaging the groove formed between the protrusions on the first damping member.

8. The device as claimed in claim 5, wherein said damping member combining boss of said first body portion of said connector forms a second protrusion engaging the groove formed on said flange portion of said first damping member to prevent the rotation of said connector.

9. The device as claimed in claim 5, wherein said second body portion of said connector forms a rotation prevention portion for preventing rotation of the first damping member by engaging, upon insertion of said damping member into said damping member fitting hole of said second body portion of said connector, the groove formed between the protrusions of the second damping member.

10. The device as claimed in claim 2, wherein the distance between positioning ribs to a head of a fastening means fastened on said speaker system fitting boss is longer than the axial length of said second damping member, and the diameter of said speaker system fitting boss is smaller than the inside diameter of said body portion of said second damping member, such that compression of said fastening means against said second damping member is prevented and the movement of said speaker system coupled with said second damping member is made along the axial direction of a speaker system fitting boss.

11. A speaker for a video display equipment having: a back cover arranged behind the speaker; speaker mounting means arranged at spaced locations on the back cover; a cabinet; and multiple damping means connected to the speaker mounting means and coupling the speaker means and the back cover to the cabinet, the multiple damping means being installed between the speaker and the cabinet such that the transmission to the cabinet of vibrations generated by the speaker is reduced.

12. The speaker as described in claim 11, wherein said cabinet comprises a speaker system fitting boss coupled with said second damping member by means of a fastening means on the top portion thereof and a plurality of positioning ribs for defining the insertion position of said second damping member on the outer peripheral surface of said speaker system fitting boss.

13. A multiple damping device for a speaker system for a video display equipment having a cover frame united-type

speaker means for generating sound, a back cover assembled at the back portion of said cover frame united-type speaker and installing a damping member fitting portion at the top and bottom portions thereof, respectively, and a damping member adapted to be inserted into a damping member fitting hole to couple said cover frame united-type speaker and said back cover on a cabinet and for damping the vibration generated upon the operation of the speaker and transmitted to said cabinet, said multiple damping device comprising:

a multiple damping means adapted to be installed between said cover frame united-type speaker and said cabinet to thereby cut the transmission of the vibration generated upon the operation of said speaker system to said cabinet.

20

**Application No:** GB 0009330.2 **Examiner:** Peter Easterfield
**Claims searched:** 1 to 13 **Date of search:** 24 July 2000

# Patents Act 1977
# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4J (JA, JDQ)

Int Cl (Ed.7): G06F 1/16; H04N 5/64; H04R 1/02, 5/02

Other: Online: WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| A | GB 2303992 A | (LG ELECTRONICS) | |
| A | GB 2302233 A | (LG ELECTRONICS) | |
| X | US 5881989 A | (O'BRIEN et al) see fig 1 | 1, 11 & 13 |
| X | US 5689574 A | (HEIRICH et al) see figs 2 & 13 | 1, 11 & 13 |
| X | WO 95/01078 A1 | (APPLE) | 1, 11 & 13 |

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| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |